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Predictors of the outcome in patients with primary intracerebral hemorrhage at Zagazig University Hospitals, Egypt

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ABSTRACT

Intracerebral hemorrhage is characterized as the most lethal early form of stroke, with high rates of mortality, not only during the initial hospitalization phase (39%), but also three months later (33.5%) with a significant long-term disability. The aim of our study was to assess the most important outcome predictor variables in patients presented with spontaneous ICH. In our present study, we included 116 patients diagnosed with spontaneous ICH, their mean age 62.54±11.45 years and ranged from 22-90 years with median of age 63 years. Males were 57.8% and 42.2% were females. Most of our patients were right handed 96.6%. The vascular risk factors were hypertension in 86.2%, DM in 15.5% and current smoking in 37.9%.all patients were subjected to Full history taking, General and neurological examination with assessment of neurological function on admission using National institutes of Health Stroke Scale (N.I.H.S.S.). Laboratory assessment on admission including: the total leukocytic count and HB level D dimmer level and Computerized Tomography All the included patients were followed up, both clinically using the NIHSS score, radiologically with CT brain after 1 week and 4 weeks of the onset to assess the growth, complications or resolution. The results showed that: There is more common predilection of primary ICH to occur in the winter months. Motor dysfunction is the most common clinical presentation with the majority in the right side of the body. Basal ganglia especially putamen is considered as the commonest site for primary ICH mostly on the left side. The 30 day mortality was about one third of the patients. Hematoma volume on admission has a significant positive correlation with NIHSS, ICH score and admission diastolic hypertension and negatively correlated with GCS. Admission GCS, NIHSS and ICH score have a significant predictive value of the 30 day mortality and disability in cases of SICH. Elevated blood pressure, stress hyperglycemia, leukocytosis, elevated CRP, D-dimer and large hematoma volume, all these factors significantly predict the overall mortality after one month.

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Introduction

Intracerebral hemorrhage (ICH) is the second most common cause of stroke, following ischemic stroke and has been reported to be associated with high mortality and morbidity **(1).** A 30-day mortality for ICH has been reported to be 35–52 % and one-half of the deaths occurs in the acute phase, especially within the first 2 days **(2).** Information regarding factors contributing to early neurologic deterioration after stroke can guide the early management strategies and lead to more favorable outcomes **(3).**

SUBJECTS AND METHODS

A.Technical design:

Sample size: according to the power of study 80% & 95% confidence interval and the markers of severity &outcomes; the sample size estimated to be 116 patients included in our study, 67 of them were males and 49 were females with their mean age 62.54 ± 11.45 years.

Inclusion and exclusion criteria: The study included patients with recent primary ICH, admitted to Neuro-Critical Care Unit and Stroke Unit of Neurology Department of Zagazig University Hospitals.

We excluded the patients with head trauma, recent surgical hematoma evacuation, recent ischemic stroke, patients with recent subarachanoid hemorrhage, chronic liver disease, malignancy, patients with delayed admission after 72 hours).

B. Operational design:

All patients were subjected to:

A. Full history taking, stressing on vascular risk factors including hypertension, diabetes mellitus, dyslipidemia, smoking, use of anticoagulants and previous stroke.

B. General and neurological examination with assessment of neurological function on admission using National institutes of Health Stroke Scale (N.I.H.S.S.).

C. **Intra-Cerebral Hemorrhage (ICH) score**; which is composed of a basic neurological examination (GCS score and age) and radiological findings including: ICH volume (< 30 cm^3 and ≥30 cm^3), presence of IVH and infratentorial origin of the hematoma including brainstem below midbrain and cerebellum. The range of score is from 0 up to 6 points with each point predicts the percentage of expected mortality (0= 0%, 1= 13%, 2= 26%, 3= 72%, 4= 97%, 5= 100% and 6= 100%) **(4, 5).**

Laboratory assessment on admission including: Complete blood count with special interest on the total leukocytic count and HB level

Computerized Tomography We did for all patients CT brain on admission and follow up after 1st week and also after 4 weeks of onset with stress on identification of hematoma location right or left hemispheric, supra or infratentorial; hematoma volume which is measured on initial brain CT scans by the formula (Equation A x B x C × 0.5) where A and B indicate the largest perpendicular diameters through the hyperdense area on the CT scan, and C indicates the thickness of the ICH (the number of slices containing hemorrhage), and were classified according to the ICH score into < 30 cm3 & ≥ 30 cm3. In addition to the midline shift which classified into three categories according to **Lobato classification** (<5mm, 5-15mm and >15mm) **(6)**, hematoma growth (which indicates expansion or increase in its volume about 33% or 12.5 ml in subsequent follow up **(7)**, presence of surrounding edema (mild, moderate and severe), intraventricular extension whether involving lateral and/or third and/or fourth one/s.

D. All the included patients were followed up, both clinically using the NIHSS score (neurological deterioration is defined as an increase of the score ≥ 4 points than the baseline score) **(8),** radiologically with CT brain after 1 week and 4 weeks of the onset to assess the growth, complications or resolution. Correlation between patient's NIHSS and hematoma parameters in follow up CT brain.

E. The correlation between these variables and functional outcome was analyzed using the statistical analysis by the Statistical Package of Social Sciences (SPSS).

RESULTS

Table (1): Demographic data & risk factors of the studied patients (N=116)

Demographic data & risk factors	**The studied patients (N=116)**	
	No.	%
Age (years)		
Mean ± SD	62.54 ± 11.45	
Median (Range)	63 (22 – 90)	
Sex		
Male	67	57.8%
Female	49	42.2%
Handedness		
Right handed	112	96.6%
Left handed	4	3.4%
Risk factors		
Smoking	44	37.9%
Hypertension	100	86.2%
Diabetes mellitus	18	15.5%

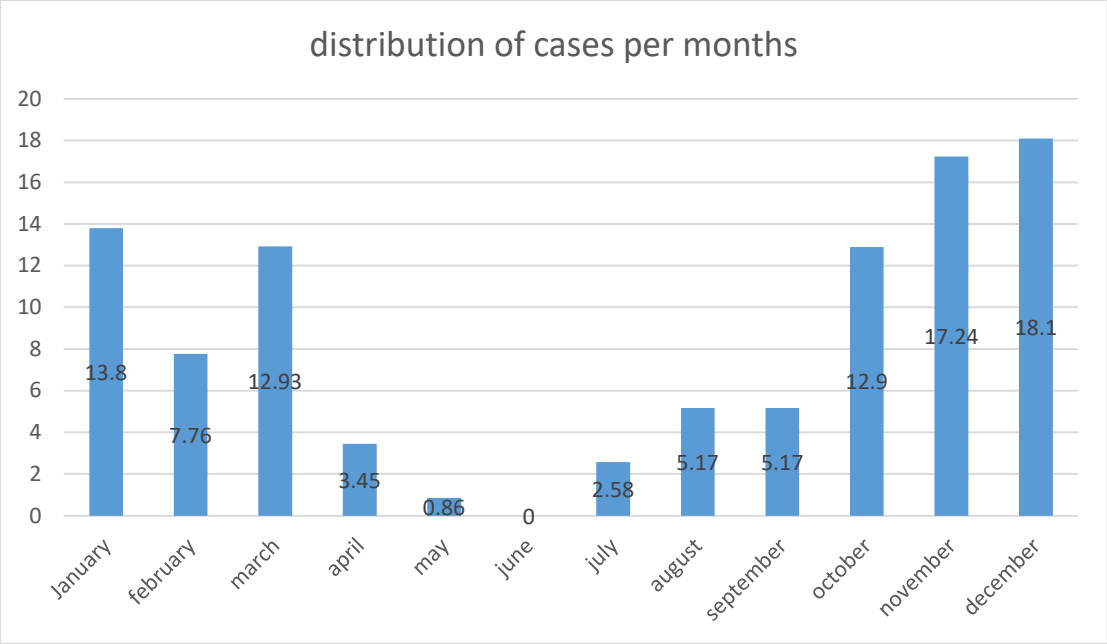

Figure (1) showing distribution of patients according to time of onset per months, with higher prevalence in winter months with highest rate in December 18.1%.

Table (2): Presentation of the studied patients (N=116)

Presentation & affected side	**The studied patients (N=116)**	
	No.	**%**
Presentation		
Motor	**100**	**86.2%**
Sensory	**1**	**0.9%**
Aphasia	**31**	**26.7%**
Ataxia	**4**	**3.4%**
Coma	**11**	**9.5%**
Seizures	**15**	**12.9%**
Lateralization		
Not lateralized	**1**	**0.9%**
Right side	**56**	**48.3%**
Left side	**48**	**41.4%**
Both sides	**11**	**9.5%**
Glassgow Coma Score		
Score 3 – 7	**17**	**14.7%**
Score 8 – 13	**56**	**48.3%**
Score 14 – 15	**43**	**37.1%**

This table showing that the most prevalent presentation of our patients, is the right sided motor dysfunction, followed by aphasia then seizures.

Table (3): Correleation between volume of Hematoma at admission and selected study parameters in all studied patients (N=116)

Variables	**Volume of Hematoma (Cm^3) at admission**		
	r	p-value	(Sig.)
WBCs ($x10^3/mm^3$)	+ 0.191	0.041	(S)
Random Blood Glucose (mg/dl)	+ 0.207	0.026	(S)
Serum calcium (mg/dl)	- 0.023	0.806	(NS)
ESR	+ 0.229	0.013	(S)
CRP	+ 0.187	0.044	(S)
INR	+ 0.014	0.885	(NS)
LDL (IU/L)	- 0.047	0.616	(NS)
D dimer	+ 0.394	<0.001	(HS)
S. GPT (IU/L)	+ 0.141	0.131	(NS)
S. GOT (IU/L)	+ 0.184	0.048	(S)
Serum creatinine (mg/dl)	+ 0.022	0.816	(NS)
Midline shift (mm)	+ 0.617	<0.001	(HS)
Edema (No, +, ++)	+ 0.168	0.072	(NS)
IVH (No, Yes)	+ 0.279	0.002	(HS)
ICH score	+ 0.599	<0.001	(HS)
NIHSS	+ 0.456	<0.001	(HS)
Hematoma resolution (No, Yes)	- 0.449	<0.001	(HS)
1^{st} week mortality (No, Yes)	+ 0.337	<0.001	(HS)
After 1^{st} week mortality (No, Yes)	+ 0.310	0.001	(HS)
mRS	+ 0.483	<0.001	(HS)

Table (4) Predictors for overall mortality in the studied cross section (N=116) by univariate analysis.

	β	SE	OR (95% CI)		p-value
Age (years)	0.000	0.018	1.000	(0.965 – 1.036)	0.999 (NS)
Male	-0.355	0.414	0.701	(0.311 – 1.579)	0.392 (NS)
Smoking	-0.467	0.440	0.627	(0.265 – 1.483)	0.288 (NS)
Hypertension	-0.156	0.584	0.856	(0.273 – 2.685)	0.789 (NS)
Diabetes	+1.405	0.531	4.076	(1.440 – 11.537)	0.008 (HS)
Motor	-2.054	0.591	0.128	(0.040 – 0.408)	0.001 (HS)
Sensory	-5.289	22.240	0.005	(0.000 – 4.301)	0.812 (NS)
Aphasia	+1.866	0.462	6.461	(2.612 – 15.978)	<0.001 (HS)
Ataxia	-6.329	18.330	0.002	(0.000 – 7.141)	0.730 (NS)
Coma	+9.530	18.222	13770.16	(0.000 – 4.4619)	0.016 (S)
Seizure	+1.914	0.597	6.783	(2.015 – 21.852)	0.001 (HS)
Rt side	+0.164	0.419	1.178	(0.518 – 2.681)	0.696 (NS)
Lt side	+1.296	0.450	3.656	(1.515 – 8.826)	0.004 (HS)
SBP (mmHg)	+0.033	0.013	1.034	(1.007 – 1.062)	0.013 (S)
DBP (mmHg)	+0.067	0.029	1.069	(1.011 – 1.131)	0.019 (S)
GCS	-0.862	0.175	0.422	(0.300 – 0.596)	<0.001 (HS)
WBCs ($/mm^3$)	+0.201	0.056	1.223	(1.095 – 1.366)	<0.001 (HS)
RBS (mg/dl)	+0.011	0.003	1.011	(1.005 – 1.017)	<0.001 (HS)
S. Ca (mg/dl)	-0.073	0.285	0.930	(0.532 – 1.625)	0.799 (NS)
ESR (mm)	+0.049	0.013	1.050	(1.024 – 1.077)	<0.001 (HS)
CRP (mg/L)	+0.037	0.011	1.038	(1.016 – 1.060)	0.001 (HS)
LDL (mg/dl)	+0.001	0.005	1.001	(0.992 – 1.011)	0.761 (NS)
D-dimmer	+0.001	0.000	1.001	(1.001 – 1.001)	<0.001 (HS)
Basal ganglia	-0.818	0.467	0.441	(0.177 – 1.101)	0.079 (NS)
Thalamus	-7.355	24.672	0.001	(0.000 – 6.401)	0.766 (NS)

Lobar	+1.002	0.740	2.724	(0.639 – 11.611)	0.175 (NS)
Cerebellar	+0.681	0.793	1.975	(0.417 – 9.350)	0.391 (NS)
Brain stem	+2.426	1.139	11.310	(1.214 – 105.374)	0.033 (S)
Initial hematoma volume	+0.047	0.011	1.049	(1.027 – 1.071)	<0.001 (HS)
Hematoma. Expansion	+0.070	0.036	1.072	(0.998 – 1.152)	0.055 (NS)
CT Rt side	+0.621	0.416	1.861	(0.823 – 4.210)	0.136 (NS)
CT Lt side	-0.134	0.414	0.875	(0.388 – 1.971)	0.747 (NS)
Midline shift	+0.443	0.103	1.557	(1.273 – 1.903)	<0.001 (HS)
Mod. edema	+1.540	0.734	4.666	(1.108 – 19.649)	0.036 (S)
IVH	+0.197	0.505	7.172	(2.668 – 19.280)	<0.001 (HS)

Table (5): Correlation between Glassgow Coma Score, Intracerebral Hemorrhage score, National institute of health stroke score, modified Rankin Score and selected study parameters.

Variables	**GCS**		**ICH score**		**NIHSS**		**mRS**	
	r	p-value (Sig.)	r	p-value (Sig.)	r	p-value (Sig.)	r	p-value (Sig.)
Age (years)	-0.057	0.540 (NS)	+0.145	0.121 (NS)	+0.094	0.316 (NS)	+0.108	0.247 (NS)
SBP (mmHg)	-0.321	<0.001 (HS)	+0.245	0.008 (HS)	+0.359	<0.001 (HS)	+0.161	0.084 (NS)
DBP (mmHg)	-0.241	0.009 (HS)	+0.151	0.105 (NS)	+0.267	0.004 (HS)	+0.167	0.073 (NS)
WBCs (x103/mm3)	-0.259	0.005 (HS)	+0.309	0.001 (HS)	+0.282	0.002 (HS)	+0.333	<0.001 (HS)
Random Blood Glucose (mg/dl)	-0.389	<0.001 (HS)	+0.391	<0.001 (HS)	+0.364	<0.001 (HS)	+0.382	<0.001 (HS)
Serum calcium (mg/dl)	+0.280	0.002 (HS)	-0.161	0.084 (NS)	-0.251	0.006 (HS)	-0.033	0.726 (NS)
ESR	-0.397	<0.001 (HS)	+0.368	<0.001 (HS)	+0.422	<0.001 (HS)	+0.355	<0.001 (HS)
CRP	-0.376	<0.001 (HS)	+0.414	<0.001 (HS)	+0.337	<0.001 (HS)	+0.352	<0.001 (HS)
INR	-0.119	0.203 (NS)	+0.009	0.920 (NS)	+0.078	0.403 (NS)	+0.022	0.812 (NS)
LDL (IU/L)	-0.004	0.962 (NS)	+0.035	0.712 (NS)	-0.037	0.693 (NS)	+0.045	0.629 (NS)
D dimer	-0.456	<0.001 (HS)	+0.376	<0.001 (HS)	+0.315	0.001 (HS)	+0.510	<0.001 (HS)
Volume of hematoma (Cm3)	-0.455	<0.001 (HS)	+0.599	<0.001 (HS)	+0.456	<0.001 (HS)	+0.483	<0.001 (HS)
Midline shift (Cm)	-0.463	<0.001 (HS)	+0.468	<0.001 (HS)	+0.386	<0.001 (HS)	+0.481	<0.001 (HS)

r correleation coefficient. p< 0.05 is significant. Sig.: Signficance.table showed that admission leukocytosis, hyperglycemia, ESR, CRP,D-dimer, Hematoma volume and midline shift, all are positively correlated with the used

scores (GCS, NIHSS, ICH and mRS). Serum Ca is positively correlated with GCS and negatively correlated with NIHSS (the reverse is true in Blood pressure correlation with both GCS and NIHSS).

DISCUSSION

Our results revealed that there are differences between months of the year as regards the rate of patients who admitted with ICH during these months, we found that the rate was higher in December, November, January, March and October (18.1%, 17.24%, 13.8%, 12.93% and 12.93) respectively with more predilection in the winter months (about 49%). This seasonal variation was also found by **Ramirez-Lassepas et al.,** who studied seasonal variation of ICH among 118 patients and found that its rate in winter was 37% **(9)**. Similar results were found by **Hu et al.,** who reported that about 29.3% out of 266 cases were in winter and there was a tendency for a higher incidence in winter compared to summer (P=0.06) **(12)**. Different results were concluded by **Raj et al.,** who didn't find statistically significant difference in the occurrence of hemorrhagic stroke between the seasons with different temperature or months (P =5.19) in 583 patients during the interval between January 2011 and December 2012 **(13)**.

In our study, the clinical presentation of our patients was variable but motor presentation was more prevalent (86.2%) mostly right sided (48.3%), followed by speech difficulties and seizures (26.7% and 12.9% respectively), patients that were presented with severe disturbance of conscious level were about 9.5%. Both incoordination and sensory symptoms were less prevalent among our patients (3.4% & 0.9% respectively). This was compatible with to the results of **Attia et al.,** who found that, focal motor symptoms represented about 92.5%, speech difficulties represented 12.5%. On the other hand, seizures were higher than ours (17.5%) **(13).** In contrast to our results, **Hu et al.;** found in a study included 266 patients that disturbed level of consciousness was more prevalent (44.0% of all cases), followed by focal neurological symptoms (43.2%) but this study was done in Chinese patients and cases were included regardless the cause of ICH **(10)**.

Regarding to the hematoma location in our patients, we found that the most common site in CT findings, is basal ganglia (77.6%) specially left sided (52.6%) followed by lobar (6.9%) then cerebellar (6%), both thalamic and brainstem sites (5.2%) &(4.3%) respectively and the IVH was associated with these locations in 50.9% of patients. Our results were matched with **Daverat et al.,** who reported that 47.6 % located in BG (Putamen) and 50% of the included patients, their hematomas were located unilaterally left **(14)|.** This coordinated with the results of **Hallevy et al.,** regarding location of ICH, the more prevalent in 84 patient is BG 88 (41.3 %), Lobar 56 (27.0%) and Thalamus 32 (16.7%) **(15).** In **Tetsuji et al.,** they found also that the most common site of ICH was the B.G (127 patients, 36%), followed by the thalamus (115, 33%), lobar areas (53, 15%), brainstem (30, 9%), and cerebellum (25, 7%) **(20)**. **HU et al.,** also reported that BG was more common (34.2%) in their study which included 266 patients but reported that 47.4% of them were unilateral right in diverse to our own **(10)**. Lastly, **Lee et al.,** found that the sites of ICH origin was basal ganglia in 33.3%, lobar in 30.4%, thalamus in 21.2%, cerebellum in 8%, and pons in 6% patients **(21).** On the other hand our results were in disagreement with the findings of **Attia et al.,** who found that lobar hematoma more common (65%) then IVH (47.5%) followed by 15% in BG but this study was done on smaller sample size (40 patients) and their ages were 15-45 years **(13).**

In this study, the hematoma volume varied between our patients. While patients with hematoma volume ≤ 30 cm^3 are 68 patients (58.6%), those with large hematoma volume 30 cm^3 are 48 patients (41.4%). Recently (**18),** found that patients with hematoma volume ≤ 30 cm^3 are (75.7%) and those with hematoma volume >30 cm^3 are (24.3%) but their study was on larger sample size (596 patients).

In our patients, the overall 30 days mortality was 33 out of 116 patients (28.4%) of which 13.8% during the first week of onset and 14.6% during the subsequent three weeks. The remaining percentage (71.6%) have variable degrees of disabilities between motor (67.2%), speech (13.8%), cognitive (8.6%), visual field (6.9%) and sensory disabilities (6.9%). The range of the recorded mRS was 1-6 points with no patients scored 0/6 or 5/6. Patients scored 1-2 were 18.9%, those with score 3-4 were 52.6% and patients with 6/6 score that equal to mortality. The outcome of our patients as regards the mortality and disability was quietly in same line with the previous studies like that of **(20),** who reported that 32.3% of patients were died within the first month. Similarly **Zis et al.,** found that 30-day case fatality rate in their ICH patients was 31.9%, as 61 patients died within 30 days after the ICH out of 191 patients included in their study **(19)**. Again**, Stein et al.,** observed that 30-day mortality was 28.6%, but in contrast to our results regarding disability, they found only 17.4% of the patients showed a favorable functional outcome (mRS ≤ 3) versus 56.8% in our patients **(21)**. In **Hu et al.,** they reported that overall hospital mortality was 24.4% and mean time from admission to death was (10.5±18.5) days, of them 36 patients died in the first 72 h due to neurological complications. Of their total sample, 21.8% recovered fully (with no lasting sequelae), while 50.4% improved after therapy but with lasting sequelae but the

discrepancy of their results with ours may be due to the larger sample size (266 vs 116) and not all patients were of primary type of ICH **(10).** In our results the absence of patients that had independent life activity after one month of ICH may be due to the short time of follow up, small sample size as compared to multicenter studies or epidemiological ones and also the defect in complementary treatment strategies as nutritional, rehabilitation and psychological.

Early increase of blood pressure is common in acute ICH and has been associated with poor outcome **(22).** In our patients, the mean systolic blood pressure was 169.13 ± 17.95 mmHg, and the mean of diastolic blood pressure was 99.48 ± 8.42 mmHg. We found that diastolic blood pressure readings on admission has significant correlation to the hematoma volume in the first CT (P= 0.012). These results were in the same line with that of **Terayama** and his colleagues**,** who concluded that there is a correlation between mean blood pressure and volume of hematoma in acute ICH patients with fatal and nonfatal outcomes **(23)**. Our results are in agreement with the findings of **Maruishi** et al., who concluded that hematoma enlargement was significantly correlated with increased blood pressure (p = 0.0004) **(24)**.

The evaluation of GCS score on admission in our study, we found that that 48.3% of the patients had GCS 8-13 while 14.7% of patients were comatose and there was a high significant correlation between GCS and the hematoma volume at that time (P= <0.001). Moreover, hematoma resolution during the first month was significantly correlated to admission GCS (P= 0.001). These results are in agreement with **Broderick et al.,** who found that there was a significant relation of hematoma volume to GCS on admission when they reviewed retrospectively 188 cases with spontaneous ICH **(25)**. Similarly **Qureshi et al.,** found that patients with a large hematoma usually have a decreased level of consciousness (GCS) at presentation **(26).** Both **Joarder et al. & Wang et al.** found that hematoma size is significantly related to admission GCS in their patients and the more the volume of hematoma less was the GCS among 48 patients with sICH **(27,28).**

Fifty six patients out of 116 patients in our study have admission hyperglycemia (> 140 mg/dl) whether they were diabetic or not, we concluded that there is highly significant relation of admission hyperglycemia with the overall mortality (P= 0.004) specially within the first week of onset. These results were also similar to that obtained by **Passero et al.,** who found that hyperglycemia has an association with 30-day mortality (OR 1.53; 95% CI 1.33 to 1.74) **(29).** And also similar to the results of **Kimura et al.,** that admission glucose level >150 mg/dl (p=0.03) was found to be independently associated with early death **(30).** And correlated with the results of **Wu et al.,** hyperglycemia (≥140 mg/dl) on arrival was found to be strong predictive factors of poor outcome at discharge in patients with acute sICH (P= 0.008) **(31).** A meta-analysis was done by **Tan et al.,** who reported data from eight studies, their results were matched with our own in that the relative risk of early-term mortality (death during hospital stay or within 1 month of onset) was significantly associated with sICH with hyperglycaemia and there was a 3.65-fold increased risk of mortality in patients with hyperglycaemia compared with patients without hyperglycaemia (P < 0.0001) after the onset of sICH **(32)**. Our results are in disagreement with **(33),(34)** who did not identify that admission glucose level as an independent predictor of mortality at 30 days after hemorrhagic stroke according to what was reported by **Capes et al.,** in their systematic review and meta-analysis of the literature relating acute poststroke glucose levels to the subsequent course and outcome **(35).**

In the present study, our results showed that there is a highly significant relation (P= 0.001) between the 30 day mortality and level of CRP measured in the first 72 h. **Alexandrova and Danovska** also found similar results when studied 46 patients with ICH and found that The values of serum CRP levels on admission were significantly related (p = 0.003) to the lethal outcome **(36)**. This in agreement with the results of **Di Napoli et al.,** who reported that CRP is an independent predictor for death after ICH (P= 0.004) when other variables were adjusted **(37)**. Similarly, the risk of an unfavorable outcome increased 1.4 fold in the multivariable analysis for every 10-mg/L increase in CRP on admission **(38).**

Elevated plasma D-dimer has been related to unfavorable outcomes and has been suggested as a prognostic factor for ICH **(39).** Our results revealed elevated D-dimer level above 500 µg/dl in 77 patients, 39% of them died in the first month and this was significantly related to the patient mortality (P= 0.001). This in agreement with the results that obtained by **Delgado and colleagues,** as they concluded that patient's mortality was significantly related to plasma D-dimer level among 98 patients with ICH **(40).** Nearly the same findings by **Chiu et al.,** who investigated the association between serum D-dimer concentration and clinical outcomes in 170 patients diagnosed with sICH and found that there is statistically significant relation between mortality and D-dimer level (P= 0.014) **(6).** Recently it was also found that a high significant relation of the D- dimer level with the patient's early mortality in a study done on 259 patients with sICH **(39).**

We found that there is a highly significant relation of overall mortality to the initial hematoma volume (P<0.001), but no significant relation found between mortality and hematoma expansion (P= 0.055). Similar results also reached by **Daverat et al.,** who found that

there is significant relation of hematoma volume on admission with patient's mortality (P= 0.001) despite that they classified the initial hematoma volume into <10%, 10-30% and > 30% of the cerebral hemispheric volume **(14).** Also **Castellanos et al.,** reported that the volume of the ICH has significant relation with the mortality (P= 0.004) but they classified hematoma volume into <20cm³ and ≥20 cm³ **(41)**. Our results are like that were obtained by **(20),** who found high significant relation between poor outcome and initial hematoma volume (P= 0.0001) but they categorized their patient's hematoma volume into <60cm³ and ≥60 cm³ (versus <30 cm³ and ≥30 cm³ in our results). Lastly **Bakhshayesh et al.,** also found that patient's mortality is significantly related to hematoma volume (P= 0.001) **(42).**

Conclusion: In view of our results in the present study we can conclude that: patient assessment initially on admission using NIHSS and ICH score (hematoma volume and GCS are included in ICH score), is much informative and predictive than using one of them only. Also some of the laboratory parameters including admission hyperglycemia, leukocytosis, high CRP and elevated D-dimer level have an impact on the type of patient's outcome and its prediction.

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